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Effects Of Dietary Consumption Of Crataegus Oxyacantha Extract On Some Biochemical Parameters In Rats

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Abstract: *The aim of this study was to investigate the effects of dietary consumption of Crataegus oxyacantha extract on some biochemical parameters in rats. The 32 rats were randomly divided into 4 groups with 8 rats each, equally divided as 4 female and 4 male rats: Group I (Control group): no hawthorn extract administered; Group II: 25 mg/kg/day hawthorn extract per oral for 4 weeks; Group III: 50 mg/kg/day hawthorn extract per oral for 4 weeks; Group IV: 100 mg/kg/day hawthorn extract per oral for 4 weeks. The results indicated that serum glucose levels were lower and serum triglyceride and VLDL levels were higher in females compared to males in the rats administered Crataegus oxyacantha extract. Accordingly, controlled consumption of Crataegus oxyacantha extract is recommended after taking into account gender- and dosage-related differences.*
Key words: *Hawthorn, Biochemistery, Crataegus oxyacantha*

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I. Introduction

Hawthorn (Crataegus oxyacantha) is a spiny tree belonging to the rose (Rosaceae) family. Growing in the wild, hawthorn grows up to 10 m high and produces white or green thorny flowers and bright red or red fruits. Hawthorn can withstand harsh climates, prefers a site in full sun, can grow in any season, produces slightly bitterfruits, and is knownbynumerous different names in different regions.

Hawthorn is known as an important medicinal plantand isalso a rich source of phenolic compounds such as flavonoids which have been shown to have antioxidant as well as antitumoral, antiviral, anti-allergic, anti-inflammatory, and vasodilator properties (Stavric, 1994; Formica andRegelson, 1995). Chemical composition of hawthorn consists of glycosides, saponins and tannins, cratetegin, vitamin C, minerals, cardiotonic amines, acetylcholine, purine derivatives, amygdalin; and pectins (Borset al., 1990; Özcanet al.,2005; Vermaet al., 2007). Although hawthorn grows spontaneously in the wild with no human intervention and it is highly nutrient, has an attractive appearance with its flowers and leaves, and its areas of usage and benefits have been well documented, it is unfortunately underappreciated and overlooked in the society. Therefore, the present study was aimed to investigate the effect of Crataegus oxyacantha extract, a species of hawthorn, on the biochemical parameters in rats, in order to raise awareness for this plant which has been shown to have beneficial effects on the cardiovascular system.

II. Materials And Methods

Animals

The animals included 32 healthy rats obtained from Van Yuzuncu Yıl University Medical School Experimental Research Laboratory. Prior to the experiment, the rats were allowed a 7-day adaptation period and were kept under normal conditions (12-h light/dark cycle, 22±1 °C,humidity 60%).All the rats had ad libitum access to standard chow pellets and tap water throughout the experiment.

Groups

The rats were randomly divided into 4 groups with 8 rats each, equally divided as 4 female and 4 male rats:
Group I (Control group):No hawthorn extract administered.
Group II: 25 mg/kg/dayhawthorn extract per oral for 4 weeks
Group III: 50 mg/kg/day hawthorn extract per oral for 4 weeks
Group IV: 100 mg/kg/day hawthorn extract per oral for 4 weeks

Blood sampling

Following anelectrocardiographic (ECG) examination, the ratwas placed on the table in the dorsoventral position and was grasped at the scruff of the neckwith the right hand,with the thumb and index finger firmly restraining the front legs of the rat. The thoracic hair was removed by shaving andthe skin was cleansed with alcohol. After locating the pulse point, blood sampling was achieved by inserting a cannula at a

distance of 2-3 mm from the left side of the sternum to the second or third intercostal space. The blood samples were then placed in biochemical tubes and serum was separated after centrifuging.

Statistical analysis

Data were analyzed using SPSS 13.0 for Windows (SPSS Inc. Co., Chicago, IL, USA). Descriptive statistics were expressed as mean ± standard deviation (SD). Variables were compared between groups and genders using Kruskal Wallis test, followed by Dunnett'spost hoc test. A p value of <0.05 was considered significant.

III. Results

Table 1. Comparison of serum levels of biochemical parameters among the groups

Groups	Control Mean±SD	Hawthorn extract 25 mg/kg Mean±SD	Hawthorn extract 50 mg/kg Mean±SD	Hawthorn extract 100 mg/kg Mean±SD	p
Glucose	170.500± 32.693	180.380± 31.062	187.000± 81.768	193.250± 110.954	0.797
Trygliceride	106.700± 58.896	113.213± 63.810	168.713± 155.538	62.387± 5.899	0.101
Cholesterol	57.250± 7.421	60.250± 10.181	63.250± 10.278	56.750± 14.440	0.368
VLDL	21.380± 11.661	22.750± 12.792	33.620± 31.140	12.380± 7.029	0,122
AST	113.250± 22.147	92.750± 25.877	124.120± 29.624	141.380± 54.432	0.111
ALT	47.750± 17.974	39.000± 7.368	45.750± 8.812	44.120± 11.090	0.390
CK	1385.250± 438.067	945.250± 444.753	1333.120± 731.356	1210.000± 837.904	0.380
CK-MB	1823.620± 702.480	1374.500± 691.962	1609.880± 675.671	1905.880± 994.342	0.601
Magnesium	3.845± 2.657	2.991± 0.385	2.875± 0.700	3.049± 0.775	0.505
Troponin I	0.095±0.104	0.109±0.152	0.794±1.741	0.495±1.191	0.861

No significant difference was found among the four groups with regard to serum glucose, triglyceride, cholesterol, VLDL, AST, ALT, CK, CK-MB, magnesium, and troponin I levels.

Table 2. Gender-based comparison of serum levels of biochemical parameters

Genders	Female Mean±SD	Male Mean±SD	p
Glucose	144.560±43.824	221.000±70.207	0.001
Trygliceride	154.281±118,728	71.225±26.021	0.012
Cholesterol	62.380±9.542	56.380±11.177	0,126
VLDL	30.750±23.809	14.310±5.082	0.013
AST	115.620±47.060	120.120±27.777	0.213
ALT	43.880±15.966	44.440±6.088	0.664
CK	1 158.560±684.013	1 278.250±587.620	0.366
CK-MB	1 475.500±487.171	1 881.440±945.287	0.274
Magnesium	3.347±1.905	3.033±0.710	0.777
Troponin I	0.651±1.445	0.095±0.145	0.577

A significant difference was found between the genders with regard to serum glucose levels (p =0.001), whereby mean glucose level was 144.560mg/dLin females and 221.000mg/dL in males.Similarly, a significant difference was found between the genders with regard to serumtriglyceride levels (p =0.012), whereby mean triglyceride level was 154.281mg/dLin females and 71.225mg/dL in males.A significant difference was also found between the genders with regard to serum VLDL levels (p =0.013), whereby mean VLDL level was 30.750mg/dLin females and 14.310mg/dL in males.However, no significant difference was found between the

genders with regard to mean cholesterol, AST, ALT, CK, CK-MB, magnesium, and troponin I levels.

IV. Discussion And Conclusion

Plants rich in secondary metabolites, such as phenolics, flavonoids and carotenoids, have antioxidant activity due to their redox properties and chemical structures (Ozdek et al. 2018).Hawthorn is a significant medicinal plant containingnumerous beneficial substances for human health, including flavonoids, vitamin C, organic acids, ether-oil, and glycosides. The antioxidants available in the leaves and flowers of hawthornprevent the formation of free radicals, thereby regulating cardiac function and contributing to cardiovascular health.Moreover, they also regulate coronary blood flow, protect the heart against arrhythmias, and regulate cardiac contractility and arterial pressure. Dried flowers and fruits of hawthorn can be brewed into a tea that can provide protection against upper respiratory infections, cough, cardiomyopathy, tachycardia, hypertension, kidney diseases, and atherosclerosis (Chen et al., 1998; Schwinger et al. 2000; Pittleret al.,2008).

Our results indicated that no significant difference was found among the four groups including the control group and the groups administered dietary Crataegus oxyacantha extract at doses of 25 mg/kg, 50mg/kg,and100 mg/kg with regard to serum glucose, triglyceride, cholesterol, VLDL, AST, ALT, CK, CK-MB, magnesium, and troponin I levels andno significant difference was found between the genders with regard to serum cholesterol, AST, ALT, CK, CK-MB, magnesium, and troponin I levels. In a similar way, Koç (2008) reported that no significant difference was found in serum glucose levels between the rats administered Crataegu soxyacantha extract and control rats. Walker et al. (2006) also noted that no significant difference was found in serum glucose levels between the patients administered Crataegus oxyacantha extract and healthy controls. However, Birman (2001) revealed that long-term administration of Crataegus tanacetifolia extract led to a significant decrease in serum cholesterol, triglyceride, and LDL levels. In comparison, we found no significant difference in the levels of these parameters among our groups, which could be attributed to the administration of different hawthorn species and the durations of administration. In another study, Birman et al. (2003)suggested that long-term administration of Crataegusoxyacantha extract may lead to more favorable outcomescompared to short-term administration. However, the study indicated that serum try gliceride, cholesterol, and VLDL levels decreased,though insignificantly, in the group administered 100 mg/kg Crataegus oxyacantha extract compared to the control group.

In our study, no significant difference was found among the groups with regard to cardiac markers including AST, ALT, CK, and CK-MB and in troponin I which is the most important indicator of myocardial damage. This finding is consistent with the findings reported by Weber etal.(1997) who suggested that flavonoids may enhance myocardial contractility, by Tankanowet al. (2003) who reported that Crataegus oxyacantha extract can be beneficial in heart failure, and by Pittleret al. (2008) who showed that the administration of Crataegus oxyacantha extract in the treatment of chronic heart failuremay be beneficial in the resolution of symptoms. Taken together, both the findings of our study and those reported by previous studies implicate that consumption of Crataegus oxyacantha may have no harmful effects on cardiac markers.

Table 2 presents the gender-based comparison of serum levels of biochemical parameters. Our results indicated a significant difference between the genders with regard to serum glucose levels, whereby mean glucose level of females (144.560 mg/dL)was lower than that of males (221.000 mg/dL).Moreover, although the serum glucose levels increased in all the three experimental groups compared to the control group and in males compared to females, though insignificantly, the serum glucose levels in females decreased in the groups administered 50 mg/kg and 100 mg/kg Crataegus oxyacantha extract compared to males.In contrast, Koç (2008) and Walker et al. (2006) found no significant difference in serum glucose levels and literature reviews indicate that there is no documentation of gender-based difference in serum glucose levels between the rats administered 50 mg/kg or100 mg/kg Crataegus oxyacantha extract and control rats.Therefore, we consider that this study will provide an insight forfuture studies investigating gender-based differences in the administration of Crataegus oxyacantha extract.

The results also indicated a significant difference between the genders with regard to serum triglyceride levels, whereby the mean triglyceride level in females (154.281 mg/dL)was higher than that of males(71.225 mg/dL). Similarly, a significant difference was also found with regard to serum VLDL levels, whereby the mean VLDL level in females (30.750 mg/dL)was higher than that of males (14.310 mg/dL).These findings were consistent with those reported by Birman (2001). However, serum try gliceride and VLDL levels decreased only in the group administered 100 mg/kg Crataegus oxyacantha extract compared to the control group, which implicates that the dosage administered in these rats could be inversely correlated with the levels of these parameters.

In conclusion, serum glucose levels were lower and serum triglyceride and VLDL levels were higher in females compared to males in the rats administered Crataegus oxyacantha extract. Accordingly, controlled consumption of Crataegus oxyacantha extract is recommended after taking into account gender- and dosage-related differences.

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